2 Sheets—Sheet 1.

J. F. APPLEBY.

Grain Binder.

No. 90,807. Patented June 1, 1869.

Fig. 1

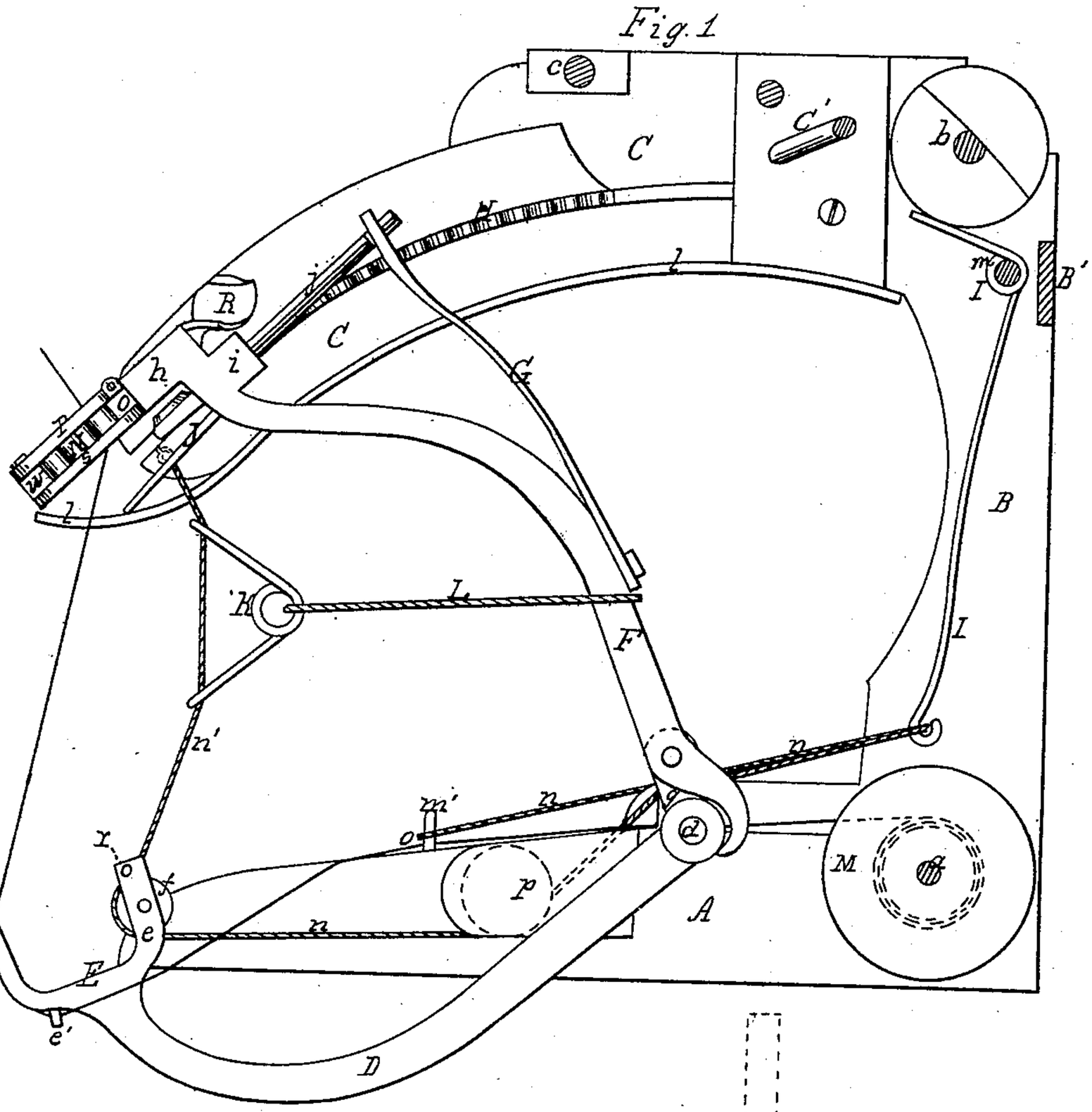


Fig. 2

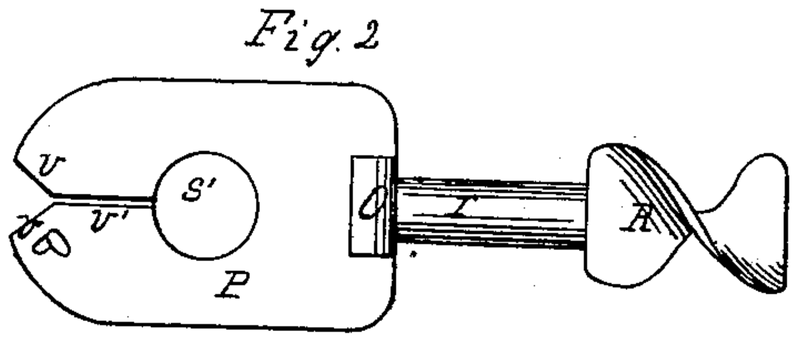


Fig. 3

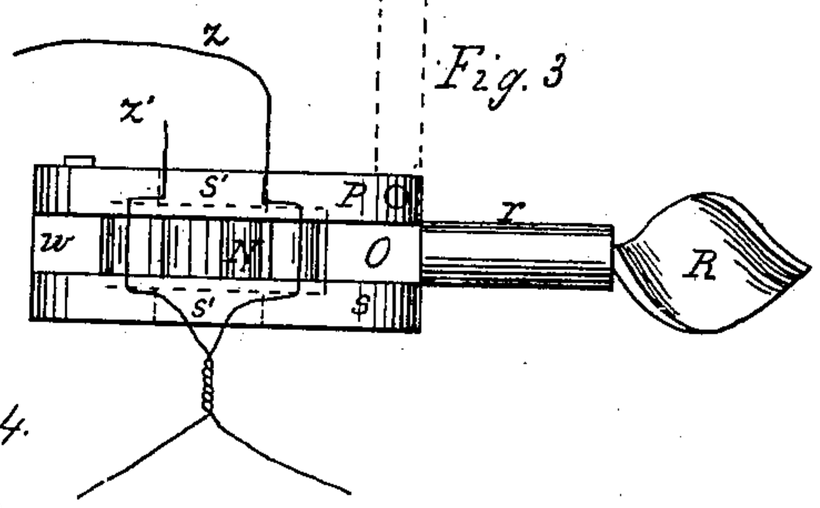
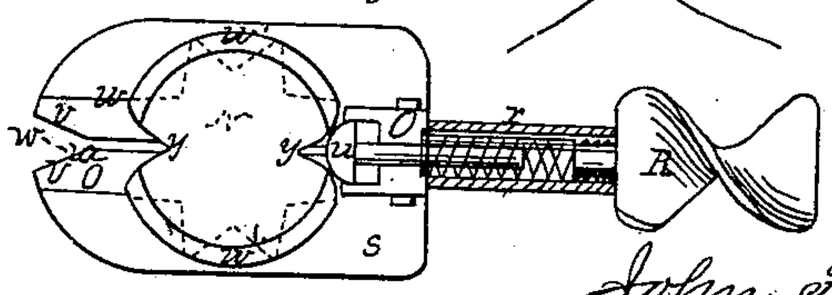


Fig. 4.



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2 Sheets—Sheet 2.

J. F. APPLEBY.

Grain Binder.

No. 90,807. Patented June 1, 1869.

Fig. 5

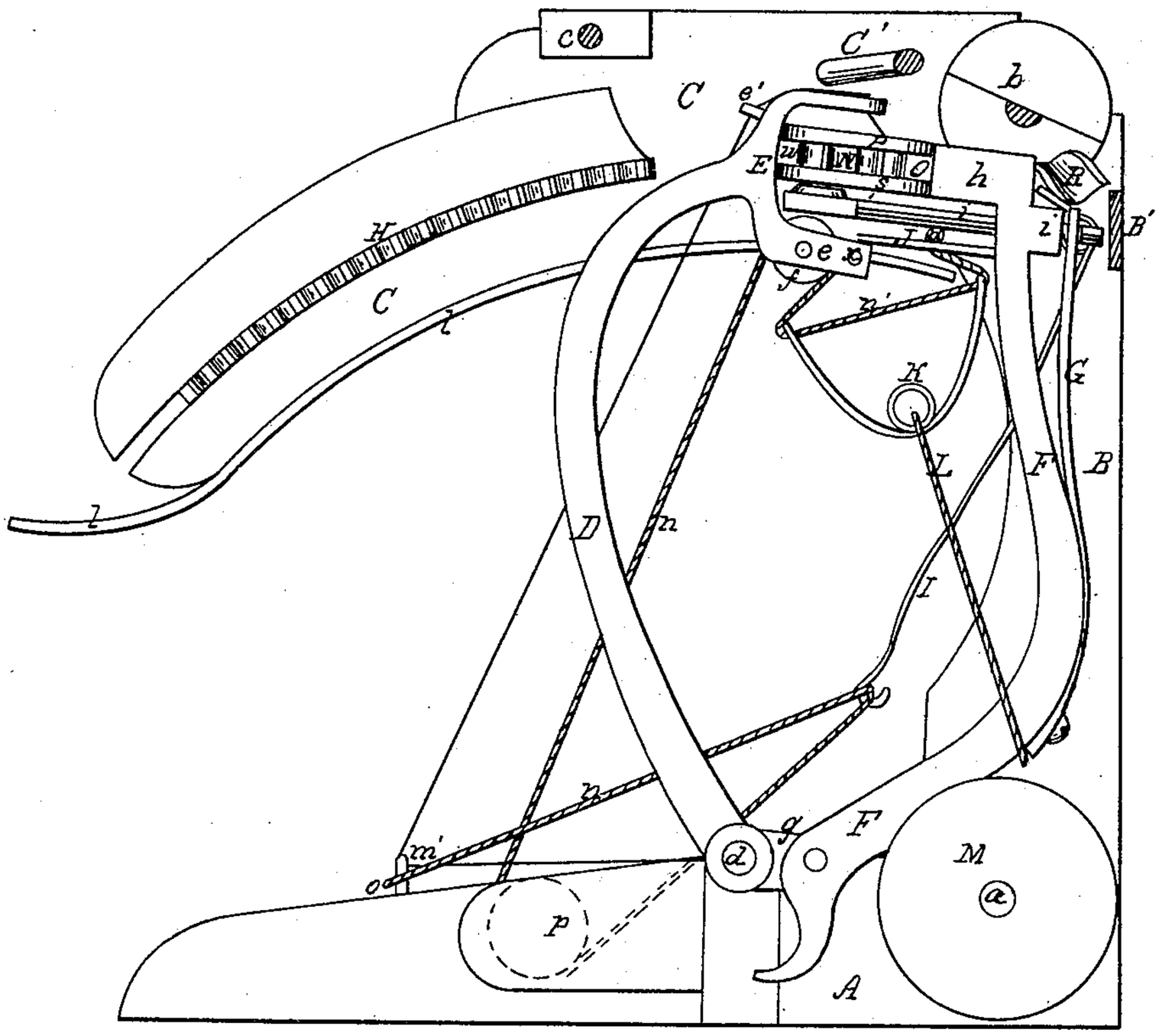
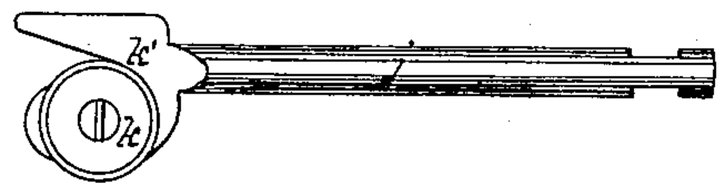


Fig. 6



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UNITED STATES PATENT OFFICE.

JOHN F. APPLEBY, OF MAZO MANIE, WISCONSIN, ASSIGNOR TO HIMSELF AND WM. THOMPSON, OF SAME PLACE.

IMPROVEMENT IN GRAIN-BINDERS.

Specification forming part of Letters Patent No. **90,807**, dated June 1, 1869.

To all whom it may concern:

Be it known that I, JOHN F. APPLEBY, of Mazo Manie, in the county of Dane and State of Wisconsin, have invented a new and useful Improvement in Grain-Binders; and I do hereby declare the following to be a full and correct description of the same, sufficient to enable others skilled in the art to which my invention appertains to fully understand and construct the same, reference being had to the accompanying drawings, which make part of this specification, and in which—

Figure 1, Sheet 1, and Fig. 5, Sheet 2, are side elevations of my improved grain-binder, showing the parts in different positions, one of the side frames being removed, so as to show the parts. Figs. 2, 3, and 4, Sheet 1, are plan, side view, and horizontal section, respectively, of the shuttle of my improved grain-binder. Fig. 6, Sheet 2, is a plan of a cutter, hereinafter more fully described.

Like letters of reference indicate like parts in the several figures.

The nature of my invention consists in the construction and arrangement of the arms F D *g*, by means of which in the forward motion the shuttle is brought in line with the rack to be operated by the same, while in its return motion the shuttle is brought into contact with a bar to be turned, and is elevated above the line of the rack, so that the latter cannot operate the wheel of the shuttle; in the construction of the arms D and F in relation to the operation of the shuttle, cutter, and wire; also, in the construction of the different parts of the shuttle and cutter, and in their respective arrangement to produce the desired result.

A, in the drawings, represents the base, B the upright, and C the top portion, of one side of the frame of my grain-binder, the two sides being connected to each other by braces *a b c*. Pivoted between the pieces A, on an axle, *d*, is a curved arm, D, ending in a forked part, E, one prong, *e*, of which is again forked to receive a pulley, *f*. At right angles, or nearly so, to the arm D, and formed with it, is a short arm, *g*, to which another curved arm, F, is pivoted. That part of this arm F which is below the pivot is curved in hook shape, and of just sufficient size to seize around the pivot of arm D, when in position, as shown in Fig. 1. The upper part of arm F is provided with two projections, *h i*, at opposite sides of the arm, and one a little below the other, which projections are formed with horizontal openings passing through them. Secured on the arm F, a little above its pivot, is a flat spring, G, its free end being forked and seizing the end of the shaft *j* of the cutter, which passes through the opening in projection *i*, and freely moves in the same. This cutter, at its free end, is forked, as shown at *k'* in Fig. 6, Sheet 2 of the drawings, and has a wheel, *k*, pivoted on one of its prongs. The wheel *k* has a beveled edge, thus forming a cutting-edge, which, together with the free prong, produces a shear cut, when the wire comes into contact with the wheel *k*, the last-mentioned prong being sharpened to a knife-edge. The projection *h* serves to receive and carry the shuttle, as will be hereinafter more fully described.

The top part C of the frame is slightly curved to form part of a circle, of which the pivot of arm D is the center, and carries on its inner side a rack, H, curved parallel to the part C, which latter is provided at its under side with a metal band, *l*, which, projecting beyond the end of part C, and curving upwardly, forms a guard to prevent the straw from getting into the operating parts, which are situated above the guard *l*. I is a coiled spring on a bar, *m*, the upper end of which bears against the under side of brace *b*, while its lower end serves to hold a bight of the rope *n*, which, being fastened at *o* to the base A, passes through or around the lower end of spring I, thence under a pulley, *p*, secured on the inner side of part A, under the pulley *f*, and is attached to a rigid tongue, J, formed on the arm F, between the projection *h* and the curved part of guard I. A brace, K, the operation of which in regard to the rope *n* will be more fully described hereafter, is connected to the arm D by a rope, L. M is a spool, rotating upon the brace *a*, and carries the wire used in binding sheaves. This wire passes from the reel through a loop, *m'*, on part A, a loop, *e*, on the outer prong of forked

part E of arm D, and opening in this prong, and is secured in the shuttle, as hereinafter more fully described.

The shuttle is clearly shown in Figs. 2, 3, and 4. It consists of the hollow stem *r*, (which passes through the opening in projection *h*, and is held in there by the spiral end R,) formed on the main part of the shuttle, being an oblong plate, *s*, which has a countersink of sufficient size to receive a toothed wheel, N, and to allow it to move freely around in said countersink, and an opening, *s'*, concentric with the same, but of a smaller diameter than the toothed wheel. The stem *r* is properly formed on the grooved standard O of plate *s*, on which the lid P of the shuttle is pivoted. The lid P is a counterpart of the plate *s*, having the same countersink and central opening.

The stem of the stop *u* passes through the standard O into the hollow stem *r*, and is provided with a flange larger than the opening through the standard, and against which one end of a coiled spring presses, which spring is placed around the stem of stop *u*, and bears with its other end against the screw-tap of the spiral end R, which is screwed into the hollow stem *r*. The head of the stop *u* moves freely in the groove of the standard O.

The plate *s* and lid P each have a slot, *v'*, leading from the opening *s'* to the end of the shuttle opposite to the standard O, forming two beveled lips, *v v*. On these lips, on plate *s*, are formed two standards, *w w*, the corresponding place on lid P being rabbeted to fit over the upper ends of said standards *w*. The lid P is locked on the standards *w* in any suitable manner.

The wheel N consists of two disks, between which the toothed wheel is formed, the ends of the teeth of the wheel being in line with the circumference of the disks, whose outer surfaces are countersunk to the thickness of the wire used, leaving flanges *w'*, which are the real bearing-surfaces of the wheel in the countersinks of the plate *s* and lid P. Between two teeth at opposite parts of the circumference grooves *y* are formed in the disks to receive the wire, wide at the circumference and converging toward the center in curved lines.

These curved edges are of great importance, as they are acted upon by the head of the stop *u* for the purpose hereinafter described.

The operation of the device is as follows: The grain after being cut is forced by a rake against the wire and the part *n'* of the rope *n*, the parts of the machine being in position as shown in Fig. 1.

When a sufficient quantity of grain has passed between the arm D and the guard *l*, the wire being forced back by the grain and unraveling from the spool M, the arm D begins to move upwardly, motion being imparted to it by any suitable means. As the arm D moves upward, the arm F on its pivot moves downward and a very little backward, just sufficient to bring the toothed wheel N against and in contact with the rack H at the same time, when the fork of the part E of arm D, carrying the wire, passes the wire through slot *v'* of the shuttle into the grooves *y* of the wheel N, and, consequently, between the teeth of the same, opposite to the one which holds the end of the wire, so that both parts of the wire surrounding the sheaf by this means are held in the opposite grooves *y* of the wheel N. The central portion of the part E of arm D, now impinging upon the end of the shuttle, in its motion forces back the arm F, thereby passing the toothed wheel N over the rack H, causing the wheel to revolve in the countersinks of the plate *s* and lid P of the shuttle, and thus twisting the two parts of the wire around each other.

Before further describing the operation of the device, it becomes necessary to explain how the two parts of the wire are passed into and held in the shuttle. At the beginning of the operation the end of the wire is passed by hand through slot *v'* into groove *y*. The wheel N is then turned one-half revolution, so as to bring the end of the wire to the rear end of the shuttle nearest to standard O. The disks of the wheel N being of a larger diameter than that of the openings *s'* in the plate *s* and lid P, the wire, in passing around the edges of the openings *s'*, and impinging against the periphery of the disks of wheel N, is forced to bend twice at right angles, as shown in red lines, in Fig. 3, once in passing through the opening *s'* in plate *s*, and once in passing through the openings *s'* in lid P, and by means of these bends is firmly and securely held by wheel N within the shuttle.

The surface of the disks of wheel N being countersunk, the wire does not interfere with the free rotary motion of the wheel N, both parts of the wire being always held in grooves *y*.

It will now be clearly understood how the wheel N, turning around, will twist the two parts of the wire one around the other, and that the two parts being apart the width of the diameter of openings *s'*, a much shorter and consequently tighter twist is obtained than by turning the parts of the wire around each other in the center.

In the fork of the prong *e* of arm D, above the pulley *f*, is secured a pin, *x*, under which the rope *n* passes after coming over pulley *f*. The long part of the wire after passing around the sheaf impinges against this pin *x*, which is so situated in the fork of prong *e* that when the shuttle comes in contact with the central part of fork E on arm D this pin *x*, together with the curved-out end of tongue J on arm F, will hold the two parts of the wire during the twisting process, directly under the center of the then lower opening *s'*. The sheaf presses against the part *n'* of the rope *n* also, and, as by the movement of arms D and F the distance between the tongue J, to which one end of the rope is attached, and the pulley *p*, is length-

ened, and the lower end of spring I is forced inwardly, this force is exerted or expanded on the sheaf of grain, helping to compress it. As the long part of the wire at the beginning of the revolution of the wheel N is in the front end of the shuttle, and as it is necessary that the same end should be, after the shuttle is turned, and when the parts are in position to bind another sheaf, at the rear end of the shuttle, the rack is so arranged as to give the wheel, beside the number of full turns desired for the twist, another half turn, which will bring the long part of the wire in position, as shown at *z*, in Fig. 3, as will be easily understood. As the arms D F move forward, the shaft *j* of the cutter comes in contact with a plate, B′, extending from one upright, B, to the other, and the arms moving on, the shaft *j* is passed for its whole length through the projection *i* and under the shuttle, the prongs of the cutter passing around the wire, under the shuttle and above the twist. As the long end *z* of the wire touches the wheel *k*, it is griped between it and the sharp prong of the cutter, and the motion of the cutter being prolonged sufficiently to make the wire revolve the wheel *k*, the wire *z* is cut off by a shear-cut, while the short part of the wire *z′* is left untouched, and still connects the sheaf to the shuttle. At this moment the two arms D F have reached the extent of their movement, and the return motion begins. The pivots of the two arms at this point being on a line, the first effect of the return motion of arm D is to elevate the arm F vertically, by means of the short arm *g*, thus lifting the shuttle vertically above the line of the rack H. As the shuttle is elevated, the sheaf has begun to start after the arm D horizontally, and by this vertical movement of the shuttle, combined with the horizontal movement of the sheaf, the short end *z′* of the wire is withdrawn through the slot *v′* without any difficulty, thus removing the piece of wire, which, were both parts of the wire cut below the shuttle by the cutter, would remain in the shuttle, and would have to be removed by hand. When the arm D in its return motion has nearly reached the end of pieces *c*, the arm F commences its return movement. A bar, *c′*, is so placed between the pieces *c* that when the shuttle is elevated to its highest point its spiral part R comes in contact with said bar, and the return motion of the shuttle on arm F causes the same to be turned around one-half turn in the projection *h*, so that the side which was uppermost becomes undermost, thus bringing the wire *z* again in position as shown in Fig. 1. The shuttle being elevated, in its return motion does not engage with, but passes above, the rack H into position, as shown in Fig. 1.

As the arm F starts on its return motion the spring G, having been overpowered by the force of the motion of arm D, regains its power, and, expanding, retracts the shaft *j* of the cutter through projection *i* until it resumes its normal position. This, of course, is done before the shuttle is turned.

The sheaf follows the arm D until the latter gets into a horizontal position, and drops out between the arms D and F, the tension of the part *n′* of the rope *n*, by the reaction of spring I, helping to force it out. If the part *n′* of rope *n* were not held back by brace K L, the same would, by reason of the tension of the spring, press the bound sheaf between the rope *n′* and the wire, thus preventing it from falling out to make room for a new one. But this is prevented by the brace, which can be adjusted by means of rope L, for larger or smaller sheaves, by drawing it back more or less.

To prevent the accidental turning of wheel N in the shuttle I apply the stop *u*, as described. This stop impinges against the periphery of the disks of wheel N, and especially the edges of grooves *y*. It allows the rack to move the wheel, the power of the motion of arm D overcoming the friction of stop *u* against the converging and rounded edges of groove *y*, the friction being, however, strong enough to prevent any accidental turning of wheel N when not acted upon by the rack H.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The combination and arrangement of the arms D *g* F, operating substantially as and for the purposes set forth.

2. The arm D, when provided with a forked part, E, one prong of which is again forked to receive a pulley, *f*, and pin *x*, as and for the purpose set forth.

3. The arm F, when pivoted on the arm *g*, and provided with hooked lower end and projections *h i*, substantially as and for the purposes described.

4. The rope *n*, when arranged as described, and operated by a spring, I, in combination with the arms D F, substantially as and for the purpose set forth.

5. In combination with the rope *n*, spring I, and arms D F, the brace K L, arranged to operate substantially as and for the purposes set forth.

6. In combination with the arm D, the guard *l*, when arranged and operating substantially as and for the purposes set forth.

7. The shuttle, when constructed with the hinged lid P and grooved standard O, substantially as and for the purposes set forth.

8. The spring-stop *u*, when arranged to operate in the grooved standard O and hollow stem *r* against the grooves *y* in wheel N of the shuttle, substantially as shown and described.

9. The spiral end R of the shuttle, in combination with the bar C′, substantially as and for the purposes set forth.

10. The toothed wheel N of the shuttle, the flanges of its disks being even with the ends of its teeth, and provided with two grooves,

y, diagonally opposite each other, in combination with the openings S′ in the shuttle, which openings are of smaller diameter than the wheel N, for the purpose of seizing and holding the two parts of the wire, and producing a short twist, substantially as herein described.

11. The cutter *j k′ k*, moving freely in projection *i* of arm F, and operated by spring G and plate B′, substantially as and for the purposes set forth.

12. The cutter *j k′ k*, when arranged to operate in such a manner as to cut off the long part of the wire only, as and for the purposes described.

13. The combination of the pin *x* in the forked part E of arm D, with the tongue J on arm F, for the purpose of keeping the two parts of the wire under the center of the shuttle during the operation of twisting, substantially as and for the purposes set forth.

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